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STUDIES IN THE MALACHIIDAE

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The recent acquisition of material in the present subfamily Malachiinae has brought to light several new species, as well as afforded an opportunity for observations on other species in the group that are believed to be worthy of recording.

Tanaops Lec.

Since the last key to this genus was published, by Fall in 1917 (1), three new species have been described which, with the present five new species (one a variety), increases the twelve species listed by Fall to twenty. It is obvious that a new key to the genus is indicated. The following is a modification of Fall's key, enlarged to include the additional eight species. The fact that the primary division is based on a male character is not as much of a disadvantage as it might seem, since it is not safe to attempt the identification of unique females, due to the close resemblance of many of the species to certain species of *Attalus* Er. and the complete failure of the length of the head and position of the antennae as generic characters.

As several of the species are extremely variable, it is sometimes almost impossible to satisfactorily place isolated specimens, even males. In an attempt to find a more satisfactory differential character, Mr. J. W. Green has dissected out the male genitalia in several species and he informs me that they are "devoid of characters for the separation of species." He describes the aedeagus as "in the form of a parallel-sided flattened tube with the tip reflexed and narrowed to a point." I might add that in numerous male specimens before me the aedeagus is completely extruded and at the base of the penis, which projects from the above-mentioned tube in the form of a straight, sharply pointed bristle, some, but not all, of the species show a ring or crown of anteriorly projecting spinules, whose obvious function is to prevent the premature or accidental withdrawal of the organ. Forward projecting barbs are also noted along the edge of the tube in a few instances in which the spinules are lacking, whose function is probably the same as that of the spinules.

Unfortunately, the degree of serration of the male antennae sometimes varies in the same species and in at least two of them, *basalis* and *sierrae*, some specimens cannot be satisfactorily assigned to either of the main divisions. These two species have accordingly been included in each of the main sections of the key.

TABLE OF SPECIES

- a. Antennae strongly serrate, the outer edge of the intermediate joints (6, 7 and 8) more or less sinuate in the male.
 - b. Side margins of the elytra pale throughout.
 - c. Abdomen of female (except the last segment) red, of male black.
 - d. Head at least twice as long as wide and one-half as wide as prothorax *angusticeps* Fall.
 - dd. Head one-half longer than wide and three-fifths as wide as thorax, elytra more shining. *neglectus* n. sp.
- cc. Abdomen (except last segment) red in both sexes.

- e. Prothorax entirely or in great part red, elytra black with suture, tip and side margins pale. Antennae more strongly serrate.
 - f. Elytra shining, decumbent pubescence rather conspicuous. Thorax usually entirely red *abdominalis* Lec.
 - ff. Elytra dull, pubescence very inconspicuous, thorax with broad black median stripe *alutaceus* n. var.
- ee. Prothorax black, antennae less strongly serrate.
 - g. Elytra black, with apex and both margins testaceous *sierrae* n. sp.
 - gg. Elytra yellow, with black scutellar spot *ignitus* Fall.
 - ggg. Elytra yellow with triangular basal spot on each, often extended posteriorly to form an ill-defined vitta *basalis* Brown (2).
- bb Side margins of elytra not pale
 - h. Antennae slender, joints more cylindrical, eighth joint two and one-fourth times as long as broad, the long hairs at the tip of each joint straight *antennatus* Fall.
 - hh. Antennae less slender, joints more triangular, the eighth not over twice as long as broad, the above hairs curved.
 - i. Elytral pubescence sparse; prothorax black, with the hind angles occasionally red *longiceps* (Lec.)
 - ii. Elytral pubescence dense, prothorax pale, with a more or less well developed black central area *greeni* Marsh. (3).
- aa. Antennae less strongly serrate, the outer edge of the intermediate joints straight or virtually so.
 - j. Front coxae spined in the male; abdomen yellow (male) or black (female) *spinifer* Fall.
 - jj. Front coxae of male without spine.
 - k. Head extremely elongate; entire insect testaceous *testaceus* Marsh. (4)
- kk. Not as above.
 - l. Elytra with the apices at least pale.
 - m. Side margins of elytra pale throughout.
 - n. Head moderately elongate; elytra without a common scutellar spot.
 - o. Elytra yellow, each with a triangular basal spot *basalis* Brown.
 - oo. Elytra black, with both margins and apices pale.
 - p. Abdomen red *sierrae* n. sp.
 - pp. Abdomen black *nunenmacheri* n. sp.
 - nn. Head nearly as wide as thorax; elytra red, with common scutellar spot and subapical spot on each black *repens* Fall.
 - mm. Side margins of elytra not pale (narrow marginal bead pale in female of *oregonensis*).
 - p. Apices and apical three-fifths of suture pale *oregonensis* n. sp.
 - pp. Apices alone pale.
 - r. Head and prothorax more strongly elongate, the latter entirely black *terminalis* Fall.

- rr. Head and prothorax less elongate; the latter with more strongly rounded sides, red with median black space *dubitans* Fall.
- II. Elytra entirely blue or greenish, without pale tips.
 - s. Ventral segments entirely reddish yellow, at least in the male *mimus* Fall.
 - ss. Ventral segments in great part black in both sexes.
 - t. Prothorax less transverse, sides less strongly rounded; ventral pits coalescent *coelestinus* Gorh.
 - tt. Prothorax more transverse, sides strongly rounded, ventral pits not coalescent *complex* Fall.

All the above species are before me, except *antennatus*, which is separable from *longiceps* only by the antennal structure, and *dubitans*, which, as the name implies, is doubtfully distinct from *terminalis*.

In the following descriptions of new species, the length is given from the elytral tip to the anterior margin of the prothorax.

T. angusticeps Fall

One female, identified by Fall as "near *angusticeps*," has an entirely black venter, which is supposed to be a distinguishing characteristic of the male. This specimen may represent a distinct form, but is probably only another instance of the unreliability of color as a specific character in this genus. A much longer series than the one available would be necessary to settle the question.

T. neglectus n. sp.

Male. Moderately elongate, elytra slightly oval, widest one-third from apex; black, elytra faintly greenish, the side margins, apex and suture, except at the base, red, the lateral margins narrow and uniform in width, the sutural dilated anterior to the middle. Head not very elongate, one-half longer than wide, the width behind the eyes three-fifths the width of the thorax, black, the epistoma narrowly pale, faintly impressed between the eyes, the occiput convex, sparsely and finely punctulate, the punctures denser just internal to each eye, the front glabrous, the occiput with moderately long black pubescence. Antennae black, apex of first joint and second joint faintly paler beneath, strongly serrate, the intermediate joints sinuate on the outer side. Prothorax entirely black, polished and sparsely punctate, with distinct black pubescence, one-sixth wider than long, sides practically parallel, all the angles broadly rounded, the posterior margin narrowly reflexed, the posterior angles more broadly reflexed and impressed. Elytra strongly shining, finely punctulate, the prostrate pubescence fine and inconspicuous, the erect black hairs distributed over the entire elytral surface and unusually conspicuous. Under surface and legs black, except the narrow prosternum, trochanters, first three abdominal segments and center and margins of fourth and fifth, which are red. Tibiae and tarsi piceus. The anterior tarsi, when viewed from the side, show the suture between the second and third joints inclined in the opposite direction from all the other sutures, thus giving the second joint a V-shape in lateral profile. The ventral pits are large and well defined, those on the fifth segment coalescent in the anterior half, those on the fourth completely coalescent.

Female. Similar to the male, except as follows. The antennae are shorter and feebly serrate; elytra more strongly widened behind and the lateral margins more broadly explanate. The abdomen is entirely red, except for the last segment, which is black, and a faint piceous coloration of the posterior half of the fifth segment.

Length, male and female, 3.5 mm.

Described from a series of two males and seven females, collected by F. W. Nunenmacher, "Los Angeles, Calif., VII-2-39", exact locality not stated.

Holotype, male and *allotype*, female, and two female *paratypes* in collection of author; one male and four female *paratypes* in Mr. Nunenmacher's collection.

The series shows very little variation, for the genus. The male paratype has all of the abdominal segments black or piceus. Two of the female paratypes have the posterior thoracic angles red and one the entire lateral thoracic margins broadly red. Four of the female paratypes have the narrow lateral elytral margins more or less dilated just anterior to the middle, and in one female the pale portions of the elytra are yellow instead of red.

The species runs to *angusticeps* in Fall's 1917 table, but on comparison with a topotype of *angusticeps*, identified by Fall, it is seen that the head in *angusticeps* is slightly more than twice as long as wide and almost exactly one-half as wide as the prothorax. The eyes in *angusticeps* are more elongate and less prominent, the entire front of the head flat and distinctly impressed between the eyes, the thoracic pubescence very fine and inconspicuous. In *neglectus* the posterior half of the front and the occiput are convex, the head very indistinctly impressed between the eyes, pubescence of head and thorax more prominent, elytra broader in proportion to length, with surface much more shining and erect black setae more prominent.

T. abdominalis Lec.

This species and its variants offer some problems which I am not entirely prepared to solve at the present time. There is before me a series of six specimens, (one male, five females) from Sutter Co., Calif., which seem to have the integuments thicker, with the pale portions of the elytra much redder than in typical *abdominalis*, the entire ventral surface, except the abdomen and the narrow prosternum, black and all with a broad black median thoracic stripe, whereas in typical *abdominalis* the thorax is usually entirely pale. Three other specimens, from nearby Plumas Co., are similar, except that the red margins of the elytra are much narrower, the pubescence heavier and the thorax entirely pale. One series of specimens, from Monterey Co., Calif., appears to deserve recognition as at least a separate variety.

T. abdominalis alutaceus n. var.

Similar to typical *abdominalis*, except that the elytra are alutaceous and relatively dull and the pale prostrate pubescence is sparser, finer and much less conspicuous, the individual hairs being less than half as long as those on typical *abdominalis*. The terminal antennal joint in the male (missing on one side) is suddenly constricted at the apical third, giving the appearance of an additional joint. Thorax with a broad median black stripe.

Described from a series of one male, five females, collected at "Tassajara, Monterey Co., Calif., V-27-20", by L. S. Slevin.

Holotype, male, *allotype*, female and one female *paratype* in author's collection; three female *paratypes* in collection of Mr. J. W. Green, who is responsible for calling my attention to the distinguishing characteristics of the present form.

This form can be separated at a glance from typical *abdominalis* by the dull elytral luster and, on closer inspection, by the inconspicuous elytral pubescence. The elytral character is seen, under adequate magnification, to be due to a fine reticulation of the surface. In a series of ten specimens of *abdominalis*, all from southern California (Los Angeles and San Bernadino Counties) one specimen shows a definite tendency to vary in the direction of the alutaceous elytra, which fact lends weight to the decision to regard the new form as a variety, rather than a distinct species. None of the specimens of *abdominalis* show any reduction of the elytral pubescence, except for abrasion and in these the true character of the pubescence is apparent at the sides of the elytra. Whether the division of the last antennal joint is an accidental deformity or not can only be decided when other males of *alutaceus* are available. There is nothing of the

sort in any of the specimens of *abdominalis* at hand. All six specimens of *alutaceus* have a broad, black, median thoracic stripe, occupying at least one-third of the thoracic width. Such coloration in a similar series of *abdominalis* would be very unusual. Other differences between *alutaceus* and typical *abdominalis* are slight, and are considered to be within the limits of variation of the species.

I am frankly uncertain as to the status which should be accorded this form. It was originally sent to me as probably a new species, by Mr. J. W. Green, for whose opinion I have the greatest respect. Due to the fact that the specimens were from central California and all of the available specimens of *abdominalis*, which showed the smooth, shining elytra typical of that species, were from southern California, I was of the opinion that the dull form probably represented a geographic race, or subspecies, of *abdominalis*. Accordingly, I requested Dr. E. C. Van Dyke to examine for me the series of *abdominalis* in the collection of the California Academy of Sciences, which request he very kindly complied with. He informs me that, in the series of about eighty specimens in that collection, "the northern specimens are generally more brilliant or shining" and "the southern specimens are duller", the exact opposite of the conclusion which was suggested by my much smaller series. He states further, however, that several specimens from southern California "appear to be like the northern race" and that several from Tassajara Springs "seem to be more like our northern forms". It appears obvious from these observations that the idea of calling the present form a subspecies is untenable and for the present, I prefer the more conservative course of considering it a variety of *abdominalis*, rather than a distinct species.

T. sierrae n. sp.

Male. Elongate, the elytra slightly widened behind, black, the under side of first two antennal joints, elytral apices and narrow sutural and lateral margins, anterior trochanters, proximal end of middle and posterior trochanters, and abdomen, testaceous; labrum, tibiae and tarsi, piceus. *Head* moderately elongate, one-half longer than wide and three-fourths as wide as the thorax, broadly and rather deeply impressed between the eyes, the impression extending from eye to eye and, in the center, well up onto the occiput; shining, finely punctulate and pubescent. *Antennae* moderately serrate, the intermediate joints straight on the outer edge. *Thorax* quadrate, sides parallel, angles all rounded, exactly as long as wide, posterior margin and angles narrowly reflexed, faintly impressed at the middle of the base, the usual impressions within the posterior angles almost obsolete; surface shining, very sparsely and finely punctulate and pubescent. *Elytra* dull for the genus, alutaceus, post-scutellar impression strong, the punctures fine and sparse, the prostrate pubescence black, fine and inconspicuous, the erect setae widely distributed and prominent. Elytral apices broadly pale, the posterior half of the suture and the lateral margins very narrowly pale, with no narrowing of the black vitta. The pale lateral margin extends around the humerus and across the elytral base, to the scutellum. *Ventral surface* finely and densely punctured and pubescent. Ventral pits well defined, those on the fifth segment rounded, those on the fourth narrow, transverse, both pairs separated by a narrow partition or carina. Second segment of anterior tarsi slightly thickened and slightly projecting over the third.

Female. Similar to the male, except that the prosternum is pale, the anterior coxae piceus and the last abdominal segment black and hairy. The antennae are more slender and less strongly serrate than in the male, but more strongly serrate than in most females of this section of the genus. The thorax is 1/17 wider than long, slightly widened behind, the impressions within the posterior angles more pronounced. The elytra are more widened behind, with the lateral margins narrowly explanate.

Length, male and female, 3.0 mm.

Described from a series of two males and two females, "Nevada Co., Calif., VI-19-38" and one male, one female, "Eldorado Co., Calif., V-30-39", all collected

by Mr. F. W. Nunenmacher. *Holotype*, male and *allotype*, female, from Eldorado, Co., in author's collection. One *paratype*, female, in author's collection; three *paratypes*, two male, one female, in Mr. Nunenmacher's collection.

The series shows little variation worthy of note. All of the paratypes have the lateral pale elytral margin very slightly dilated just before the middle, the basal thoracic impression is not so well defined as in the types and in some is obsolete, and two have a deep ocellate impression each side of the thorax, just inside the center of the lateral margin. In none does the thorax show the slightest trace of red. The species does not run to anything in Fall's key. From above it looks like a dull *longiceps*, with pale lateral margins and was, indeed, sent to me as a variation of that species; from beneath it looks like a very dark *abdominalis*. From either species it may be distinguished by the straight edges of the antennal joints, the exactly quadrate thorax and the dull elytra. It appears to be confined to the high Sierras, in the general neighborhood of Lake Tahoe.

T. ignitus Fall

Four females of this species, from Santa Cruz Co., Calif., show a tendency to be piceus in those portions which are described as black in the type series and in one of these the posterior half of the elytra show a faint piceus cloud, suggesting an approach to the type of coloration seen in *abdominalis*.

T. basalis Brown

A series of thirty-four specimens (fifteen males, nineteen females), collected at Creston and Sanca, B.C., by Mr. G. Stace Smith, affords numerous specimens which correspond exactly with Mr. Brown's description of this species, from a unique male taken at Lillooet, B.C. A typical specimen has been submitted to Mr. Brown and the identification verified by him. The series as a whole, however, shows considerable variation from the typical color pattern, in that the basal black area on each elytron extends gradually backward in a poorly defined vitta which, in a few specimens, occupies all of the elytron except a narrow sutural and lateral and a broad apical margin, producing a color pattern somewhat similar to that seen in *abdominalis*. This variation seems to be independent of sex and a majority of the specimens in each sex shows an intermediate color pattern. In the dark specimens, the testaceous spot at the posterior thoracic angles disappears entirely and the underside, with the exception of the prosternum, anterior coxae and narrow margins of the abdominal segments, is black. Such a specimen, if seen "out of series," would certainly not be identified as *basalis*.

Fresh, unrubbed specimens show a very fine pubescence and punctuation of the head and thorax and the erect black setae occupy the entire elytral surface and are rather conspicuous. The males show some variation in the serration of the antennal joints, the intermediate joints in some specimens being slightly but distinctly sinuate on the outer edge. The species appears to be more closely related to *ignitus* than to *terminalis*, as Mr. Brown suggests. Mr. Brown informs me that the only specimen known to him, besides the male type, is a male topotype, which he kindly sent me for examination. A typically colored female is herewith designated as the allotype.

T. antennatus Fall

The pair of specimens mentioned in a previous communication (3) as provisionally so identified by me have been kindly compared with Fall's unique male type of *antennatus* by Mr. Nathan Banks, who states that the male is definitely not *antennatus*, but that the female "greatly resembles" the type specimen and is "quite possibly" the female of *antennatus*. The antennae of *antennatus* are more hairy, the intermediate antennal joints are more cylindrical, with the two or three long hairs at the tip of every joint straight, and not curved as they are in its nearest ally, *longiceps*, and the eighth joint is two and one-fourth times as long as broad. The pair in question, which were taken together, evidently represent a slight variation of *longiceps*. With the above additional notes, furnished

by Mr. Banks, *antennatus* should not be difficult to identify and it should be sought for among the series of *longiceps* now in collections.

T. greeni Marsh.

Three additional specimens of this species, which were examined by Fall in 1937 and labelled by him "new" are before me. They are from the type locality.

T. spinifer Fall

In his 1917 key, Fall states that the front coxae of the males, in this species, are spined, but in the description of the species he states that the front *trochanters* have an acute spine. I have four males, from Grand Canyon, Ariz., and four females, labeled simply "Ariz.," which I think are undoubtedly this species. In the males, the anterior margin of the acetabulum, at the distal end of the coxa, is deeply emarginate and the anterior surface of the coxa extends into this emargination in the form of a broad tooth which, when viewed laterally, appears as an acute spine. The anterior acetabular margins in the other species show a slight irregularity, which is evidently the homologue of this modification in *spinifer*. The apical pale areas in this species have a distinctive shape, in both sexes, in that the black portion of the elytra forming the lateral margin of the pale area extends mediad along the apical margin for a variable distance. The sexes show a distinct difference in size, the males from 2.8 to 3.0 mm, the females from 3.5 to 4.0 mm.

T. nunenmacheri n. sp.

Male. Moderately elongate, parallel, the elytra slightly widened behind; black, the elytra faintly greenish, alutaceus, the clypeus, labrum, palpi, three basal antennal joints, posterior thoracic angles, elytral apices, apical two-thirds of the suture, lateral elytral margins, prosternum, anterior coxae and all of the trochanters, anterior femora in part, distal ends of the tibiae, and the tarsi, yellow. *Head* only moderately elongate, seven-ninths as wide as the prothorax, biimpressed between the eyes, shining, finely punctulate and pubescent. Antennae not strongly serrate, the edges of the intermediate joints straight. *Thorax* quadrate, one-fifth wider than long, base slightly narrower than apex, angles all broadly rounded, broadly and shallowly impressed just within the posterior angles, surface shining, very sparsely and finely punctulate and pubescent. *Elytra* distinctly alutaceus, sparsely and finely punctulate and slightly roughened, the pale prostrate pubescence very fine and inconspicuous, a few erect black setae at the margins and apex, the yellow lateral margin dilated just before the middle and practically obliterated near the apex. *Ventral surface* and legs finely and fairly densely punctured and pubescent; abdomen almost glabrous. Sternites all black near the sides, yellow on the margins and in the center. Ventral pits on the fifth segment rather poorly defined and shallow, those on the fourth sharper and deeper, angulate laterally, both pairs coalescent in the anterior half. Second joint of anterior tarsi swollen and slightly overlapping the third.

Female. Similar to the male, except as follows. The antennae are scarcely at all serrate, the clypeus, labrum and mouth parts are piceus and the other parts which are yellow in the male are testaceous. The corneous portions of the abdominal segments are entirely black. The pale lateral elytral margins, except for the marginal bead, are entirely obliterated behind the middle.

Length, male and female, 3.0 mm.

Described from a series of two males and three females, collected by F. W. Nunenmacher, "Esmeralda Co., Nev., VI-29-07". *Holotype*, male, and *allotype*, female, in author's collection; one male, two female *paratypes* in collection of Mr. Nunenmacher, in whose honor the species is named. The series shows little variation. The male paratype has the abdominal sclerites entirely black, as in the female type, and the entire lateral margins of the prothorax are broadly pale. One female paratype has the black elytral vittae almost divided by the dilatation

of the sutural and lateral pale margins. The species does not appear to be closely related to any previously described and may be easily recognized by the following combination of characters: antennae not strongly serrate; elytra black, alutaceous, with apices, suture and lateral margins pale; abdomen black in both sexes.

T. repens Fall

In a series of eight specimens, six males, two females, from Inyo Co., Calif., one of the males has the head entirely red and the basal elytral spot absent, leaving the scutellum alone black, while some of the other specimens show a distinct tendency toward a coalescence of the basal and apical elytral spots. The females are scarcely distinguishable from those of *Attalus trimaculatus* (Mots.) except by the black metasternal side pices of *repens*.

T. oregonensis n. sp.

Male. Elongate, parallel, the elytra not widened behind, black, thorax red with black median stripe, apical three-fifths of suture, elytral apices, prosternum and first three abdominal segments yellow. *Head* moderately elongate, 1.7 times as long as wide, two-thirds as wide as the prothorax, a broad, quadrangular impression between the eyes; surface shining, finely and sparsely punctulate and pubescent. Antennae unusually stout, moderately serrate, the outer edges of the intermediate joints straight. *Thorax* quadrate, one-sixth wider than long, sides parallel, feebly arcuate, all the angles rounded, impressed as usual within the posterior angles; surface polished, with a few minute punctures, bearing short, erect, black hairs. *Elytra* black, shining, without metallic reflections, the apical three-fifths of the suture narrowly and the apices more broadly yellow; surface faintly rugulose and rather sparsely and finely punctured, the recumbent pale pubescence extremely fine and inconspicuous, the erect black setae widely distributed and conspicuous, the post-scutellar impression much more pronounced than usual in the genus. *Ventral surface* and legs finely and densely punctulate and pubescent, the pubescence less conspicuous on the abdomen. First three abdominal segments entirely yellow, the last three black, except for the central line and lateral margins of the fourth. Ventral pits transverse, shallow and rather poorly defined, completely coalescent, except for a fine longitudinal dividing carina at the bottom. Second joint of anterior tarsi slightly swollen, elongate and slightly overlapping the third.

Female. Definitely more robust, the elytra widened behind, with the lateral margins narrowly explanate and the marginal bead yellow. Thorax entirely red, except for a small triangular black spot at the center of the basal margin. Antennae scarcely serrate. Abdomen, except the last segment, entirely pale.

Length, male, 2.7 mm.; width 1 mm.; female, length 3 mm., width 1.5 mm.

Described from one male, two females, collected by Mr. F. W. Nunenmacher, "Josephine Co., Ore., VI-6-38". *Holotype*, male and *allotype*, female in author's collection; one female *paratype* in collection of Mr. Nunenmacher.

The species runs to *dubitans*, which is doubtfully distinct from *terminalis*, in Fall's key, but differs from these species in several particulars. It is a smaller species, the elytra are more shining; the prostrate pubescence is much less conspicuous; most of the suture is pale and the abdomen is differently colored.

T. complex Fall

One female, from the Huachuca Mts., Ariz., referred to this species, has the thorax entirely black, whereas Fall describes it as entirely red. The specimen was identified by comparison with the closely related *coelestinus*, on the basis of the relative thoracic measurements, as given in Fall's key. Since *coelestinus* is reported, by Fall, with both black and red thorax, as well as intermediate states, it appears reasonable to assume that *complex* probably shows a similar variability. Whether the specimen represents a new species or variety could only be determined on the basis of more extensive material.

Malachius Fab.**M. mixtus Horn**

Twelve specimens, from Chelan, Wash., and two from Copper Mt., B.C., unfortunately all females, are referred to this species, previously, so far as known to me, reported only from California. They appear to be identical in all respects with specimens from Eldorado Co., Calif., identified as *mixtus* by Mr. Nunenmacher. The species is evidently rather widely distributed in the Pacific Northwest.

M. rotgeri n. sp.

Male. Moderately elongate, slender, parallel, the elytra with very faint aeneous luster, tip of labrum, membranous band between labrum and clypeus, and anterior margins of antennal foveae ivory white; under surface of first two antennal joints, broad lateral margins of thorax, prosternum, elytral apices and posterior tibiae, except the apices, testaceous; anterior and middle tibiae and all the tarsi and palpi, piceo-testaceous, all the tibiae and palpi infuscate at their apices. Head shining, broadly impressed between the eyes, sparsely and minutely punctulate and pubescent with pale erect hairs. Antennae strongly pectinate, reaching the middle of the elytra, the branches of joints three and four stout and about one-half as long as the others; those of seven and eight longest and about one-half longer than the joints themselves. Thorax 1.4 times wider than long, sides evenly arcuate, all the angles broadly rounded, the posterior moderately reflexed; pale lateral margins each occupying about one-fourth of the thoracic width; surface smooth, shining, finely and sparsely punctulate and pubescent with pale erect hairs, which are denser laterally. Elytra comparatively dull, scabrous and densely clothed with pale, prostrate pubescence and scattered erect hairs; depressed along the entire length of the suture, where the pubescence is denser and directed diagonally backward; sides parallel to about the terminal third and then rather suddenly expanded in an arcuate fashion, making the conjoined elytral tips, with the exception of the apical spines, almost circular in outline. Elytral apices impressed, spiniform and sinuate just laterad of the spines; appendiculate, the appendices black, rather thick, especially at their margins, directed diagonally backward and inward, with their upper surfaces concave, their tips emarginate and a long, slender process along the inner margin of each appendix, at a level intermediate between the appendix and the elytral apex. The appendices are partly visible from above, by reason of the sinuations just outside the apical spines. Under surface and femora shining and clothed with moderately dense, long, pale pubescence. Tibiae and tarsi more densely pubescent, the apical third of the posterior tarsi rather strongly bent inwards.

Female. Similar to the male in size, shape and color, except that the elytra are gradually widened posteriorly, the tibiae are all darker, with less difference between the posterior and the two anterior pairs and the areas about the head which are described as ivory white in the male are more dull and yellowish in tint. The posterior tibiae are shorter and less arcuate than in the male. The antennae are rather strongly serrate and attain the basal fourth of the elytra. The elytral apices are more broadly and circularly pale than those of the male, the color is more yellow and they are unmodified.

Length, male and female, 4.0 mm.

Holotype, male and *allotype*, female, collected at "Arboles, Colo., 6,000 ft., V-27-40" by Rev. B. Rotger, C. R., in whose honor the species is named. One male *paratype*, same data, and seven female *paratypes*, five with same data, one "S. Pedro Mesa, Costilla Co., Colo., VI-9-44" and one "Pagosa Junction, Colo., VI-3-40", all collected by Rev. Rotger. Holotype, allotype, and two female *paratypes* in author's collection, one male *paratype* and three female *paratypes* in Rev. Rotger's collection and two female *paratypes* in collection of Mr. J. W. Green, who first referred the species to me.

The male paratype has the ivory areas on the head somewhat differently arranged, so as to include the entire labrum and the anterior edge of the clypeus and these have a yellowish tint. The pale areas at the elytral apices are more extensive and of a darker reddish color than in the type. The females vary in length from 3.7 mm. to 4.5 mm. The pale areas at the elytral apices vary in size and two specimens show a black dot in the pale thoracic margins, at the posterior third, with a dilation of the central black stripe opposite it. The series as a whole shows little variation.

The species belongs in the group, in Fall's 1901 table (5), which includes *spinipennis* Horn (*horni* Fall), *mirandus* (Lec.), *theventi* Horn and *directus* Fall. The appendices are intermediate, as regards their visibility from above, between *horni*, and the other three species. It is smaller and more slender than *horni* and *theveneti* and does not possess the bluish tint to the elytra seen in those species. Of the species subsequently described, it most nearly resembles *bakeri* Fall, which was described from a unique male, from California (6). It differs from *bakeri* in that the hind tibiae are not pale in their apical two-thirds, and the appendices do not at all resemble those seen in *mirandus* (or, for that matter, *directus*). Also, *bakeri*, according to the description, does not have scattered erect hairs over the elytra, a character which would scarcely have been overlooked by as careful an observer as Mr. Fall.

Microlipus Lec.

M. uniformis (Mots.)

Five males, from Forest Grove, Ore., are referred to this species, which was placed as a synonym of *laticeps* Lec. by Horn and as a synonym of *moerens* (Lec.) by Fall. It is certainly not a synonym of *laticeps* and I am of the opinion that it is a valid species. Fall stated that he had only one specimen, from Sonoma Co., Calif., with the thorax entirely dark. In the present series, none of the specimens shows the slightest indication of the yellow spots at the posterior thoracic angles, which are characteristic of *moerens*.

Since the above paragraph was written, it has come to my notice that Mr. W. J. Brown has arrived at the same conclusion as to the validity of *uniformis* (7).

In 1917 (1) Fall called attention to the unsatisfactory nature of the characters which are supposed to separate *Malachius* from *Microlipus*. I have reviewed his work, checking these characters in a majority of the species which are at the present time referred to these two genera and am in complete agreement with his conclusions, so far as our native North American species are concerned. The situation is entirely different, however, when we come to our single introduced species, *aeneus* (L.). The chief differential point relied on by both Le Conte and Horn for the separation of the two genera was the position of the antennal foveae. As Fall points out, the difference appears sufficiently definite when seen in a key, but is not borne out by actual inspection of the insects. In all of the species of both genera examined, the anterior margin of the antennal fovea is almost exactly tangential to the fronto-clypeal suture, which appears as an impressed line, faint in some species, and the external margin is almost in contact with the base of the mandible. A false impression that the antennae are inserted more posteriorly in certain cases may be gained from the fact that the labrum appears to be prehensile or extensible in these insects and joined to the clypeus or epistoma by a thin, pale, elastic membrane, which might be mistaken in some instances for a forward extension of the clypeus. If a sufficient series is examined in any one species, the labrum may be found in all stages of extension and, in some cases, one border is extended farther than the other, causing it to project at an angle to the clypeus.

In *aeneus* the structure of the anterior portion of the head is entirely different. The antennal foveae are separated from the fronto-clypeal suture by al-

most the diameter of a fovea and a strong but obtuse, transverse ridge extends between the foveae, resulting in the anterior portion of the frons being in a different plane from that of the clypeus. The suture is strongly bisinuate, the lateral edges of the clypeus are strongly converging anteriorly and the anterior-posterior width of the clypeus is from two to three times the diameter of a fovea. The labrum in *aeneus* appears to be firmly united to the clypeus and not extensible, as in the other species. The male clypeus shows further modification, in the form of grooves and ridges, which is not of importance in the present connection, except that nothing similar is seen in any of our species.

These structural differences would appear to prohibit the placing of our species in the same genus with *aeneus* and, since the former are almost certainly congeneric with *Microlipus*, they should be transferred to that genus, leaving *Malachius* in our lists for the single introduced species, *aeneus*.

Anthocomus Er.

The recent publication (7) by Mr. W. J. Brown of the synonymy of his *Malachius criddlei* and *Anthocomus erichsoni* Lec. caused me to check our three species of this genus with reference to the character which is supposed to separate them from *Malachius*, i.e., the position of the antennal foveae. The situation appears to be the same as that which exists between *Malachius* and *Microlipus*, namely that the difference is really non-existent. I do not know the genotype of *Anthocomus* so cannot say whether *erichsoni* is congeneric with it, but am of the opinion that our three species, together with all those now referred to *Malachius*, except *aeneus*, and those of *Microlipus* all belong to the same genus and that Mr. Brown did not err in referring his single male specimen, with the elytra modified in the peculiar fashion of *Malachius*, to that genus. I do not believe that the other species which he mentions as agreeing well with the description of *flavilabris* (Say) is that species, as my single male of *flavilabris* does not have the elytral tips modified.

It is strange that such an error as that describing the elytra as always similar in the sexes of this genus should have stood unchallenged for almost a hundred years and is evidence of the neglect with which the present group has been treated.

The question of preparing a combined key for these three genera naturally presents itself, but will be deferred, pending the acceptance or otherwise of the ideas expressed above.

Attalus Er.

A. lobulatus (Lec.)

In a series of five specimens from Esmeralda Co., Nev., the yellow margins of the thorax and elytra are much narrower than in typical *lobulatus* from southern California, in one specimen being reduced to a barely visible line. Longer series from intervening localities would be necessary to decide the status of this form.

Another specimen, from Alameda Co., Calif., collected with typical *lobulatus*, has the thorax red, with a broad median stripe and two lateral spots black, giving it a considerable resemblance to the Eastern *circumscriptus* (Say).

A. minutus n. sp.

Male. Elongate, slightly widened behind. *Head* black, feebly shining, testaceous anterior to a line joining the center of the antennal foveae, mouth parts and genae testaceous, palpi and tips of mandibles piceus, four-fifths as wide just behind the eyes as the thorax, oval, sides strongly convergent behind the eyes, broadly and shallowly impressed between the eyes, surface finely reticulate and very finely pubescent. *Antennae* long, passing the posterior thoracic margin by two joints, feebly serrate, piceus, the under side of the first two joints testaceous.

Prothorax piceus, the anterior margin very narrowly, the posterior margin and posterior angles more broadly, testaceous, oval, one-fourth wider than long, the sides strongly arcuate, the angles all broadly rounded, posterior margin feebly emarginate and vaguely impressed just before the centre of this margin, surface reticulate as in the head and finely pubescent. *Elytra* piceus, the apices broadly, the lateral and sutural margins, almost to the scutellum, more narrowly yellow, forming a dark vitta which is narrowed in its anterior third to about one-half its width by a dilation of both lateral and sutural margins, the demarcation between the light and dark portions not sharply defined; surface alutaceus, rather densely and finely punctured, with fairly dense, semi-erect, pale pubescence; a few stouter and darker, erect hairs along the lateral margins and near the apices; the suture slightly depressed behind the scutellum.

Under surface blackish piceus, except the prosternum, mesosternal epimera and the last two abdominal segments, which are yellow. Legs picotestaceous, the femora paler, except for a piceus stripe along the outer edge of each. Lobe of second protarsal joint broad, reaching the proximal end of the fourth joint, broadest at the tip, which is obliquely truncate and narrowly black. Length 1.5 mm.

Female unknown.

Described from four males, collected by Mr. F. W. Nunenmacher, "Nogales, Ariz., IX-13-06."

Holotype and one *paratype* in author's collection; two *paratypes* in Mr. Nunenmacher's collection.

The only variation worthy of note is that two of the paratypes have the entire front half of the head pale and the thorax entirely testaceous, except for a central piceus cloud, which is broadened anteriorly.

The species runs to *lobulatus* in Horn's key (8), but *lobulatus* is a larger insect, with the light and dark portions of the elytra sharply demarcated, the elytral vittae narrowed by a marked dilatation of the sutural margin and none at all of the lateral margin, and with erect pale setae scattered over the entire elytral surface. In Champion's key to the Mexican and Central American species of *Attalus* (9), it runs to *cinctus* (Lec.) which is also much larger and has an entirely pale abdomen. It appears to be more closely related to *dilutimargo*, which Fall described in 1917 (1), but this is said to have very narrow elytral margins, which do not extend around the apex.

A new key to the species of *Attalus* is badly needed, but the preparation of this will be deferred until more material in the genus can be accumulated.

In 1895, Casey expressed the opinion that "the Melyridae should constitute a family distinct from the Malachiidae", quoting Motschulski's opinion to the same effect, expressed in 1859 and basing his opinion on the presence of extensible vesicles in the latter group and the difference in integuments and general habitus. These vesicles would, indeed, seem to indicate a divergence in bodily structure which is more than of sub-family importance. Nevertheless, Leng, in his Catalogue and Supplements, as well as all other American writers, have continued to treat the two groups as one family, although Pic, in 1929, separated what we now know as Melyridae into three families. It is believed that the next North American catalogue, which we hope will not be too long in making its appearance, will follow Casey's suggestion in treating the families Malachiidae and Melyridae as distinct.

I wish to express my sincere thanks to Messrs. J. W. Green, C. A. Frost, F. W. Nunenmacher, G. Stace Smith and Rev. B. Rotger, C. R. for the loan and gift of valuable material; to Messrs. Nathan Banks and W. J. Brown for comparing specimens with the unique types of *T. antennatus* and *T. basalis* and to Dr. E. C. Van Dyke for information concerning the series of *T. abdominalis* in the collection of the California Academy of Sciences.

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MONTREAL BRANCH, ENTOMOLOGICAL SOCIETY OF ONTARIO

The following reports the activities of the Montreal Branch of the Entomological Society of Ontario for the 73rd year.

Eight meetings were held during the 1945-46 season, six in the Lyman Room, Redpath Museum, McGill University and two in the Entomological Laboratory, University of Montreal. The average number present at the meetings was eleven, a reduction of four when compared with the figure for last year. This falling off in attendance can be accounted for in part, we believe, by the very severe weather experienced on the occasion of three of our meetings.

Our March meeting, held in the Entomological Laboratory of the University of Montreal, was made the occasion of our fifth regional gathering and was planned so that, in addition to the reading of papers, all entomologists in the Province of Quebec might have an opportunity to hear from the Quebec committee, Dr. G. Maheux, Rev. Father Fournier and Mr. Geo. A. Moore, appointed at the annual meeting of the Parent Society, to study and report on the advisability of the formation of a national organization, "The Entomological Society of Canada." The register showed an attendance of 25, and 12 papers were presented which have been duly recorded in the minutes of the meeting.

In addition to the papers read at the regional meeting, the following papers and talks were given during the season:

The Unknowns in Entomology	Geo. A. Moore
Hemiptera taken at Hudson Heights in 1944	Geo. A. Moore
Hemiptera collected at Peak's Island, Maine in 1945	Geo. A. Moore
Insects of Anderson Bog, Chaudiere Basin, P. Q.	Rev. Father O. Fournier
The Brown Dog Tick, <i>Rhipicephalus sanguineus</i> Latr.	H. A. U. Monro
A Review of Book "Living Treasure" by Ivan T. Sanderson ..	Geo. A. Moore
Kodachrome pictures of plants, insects and other nature subjects	Dr. G. H. Fisk

A total of 19 papers were read and discussed during the season; numerous exhibits of specimens were made, and many interesting subjects relating to insect life were talked over at our meetings.

Two of our members, Mr. Geo. A. Moore and Mr. G. Chagnon were elected life members of the Montreal Branch in recognition of their long association with the local society. The Parent Society also conferred this honor on Mr. Moore and Mr. Chagnon, at their annual meeting in 1945. Mr. Moore celebrated his 50th year of membership in the Society and, in addition to serving as our President, was President of the Parent Society in 1945.

A. C. Sheppard

A MINUTE ON *PARAMYRMOSA* SAUSSURE (HYMENOPTERA,
TIPHIIDAE)

BY V. S. L. PATE,
Ithaca, New York.

In his treatment of the Scoliidæ in Fedtschenko's *Reise in Turkestan*, De Saussure divided the genus *Myrmosa* into two subgenera: *Myrmosa* sensu stricto, and *Paramyrmosa*, which he defined as having "the second cubital cell [of the fore wing] trapeziform; one of its sides common with [i. e. broadly sessile on] the radial cell" and by the first abdominal segment being depressed, triangular, funnel-shaped, and not as strongly nodiform as in typical *Myrmosa*. In this new *Paramyrmosa*, Saussure includes only his new Transcaspian species, *Myrmosa Radoszkowskyi*, which thus becomes the genotype by monotypy.

Krombein, in his review of *Myrmosa**, recognizes three subgenera: *Myrmosa* in the restricted sense, *Myrmosina* Krombein, 1940, and *Myrmosula* Bradley, 1917. In the first two subgenera, the second cubital cell of the fore wing is triangular, pointed or very narrowly truncate on the radius, whereas in *Myrmosula* the second cubital cell is trapezoidal and broadly sessile on the radial vein. I have compared Nearctic specimens of *Myrmosula* with both Saussure's and Andre's† descriptions and figures of *Myrmosa Radoszkowskyi* and find they agree remarkably well in all major respects save for Saussure's remark that the clypeus of *Radoszkowskyi* is similar to that of *unicolor* (Say), but I do not attribute very much importance to this statement. Consequently, I believe that *Paramyrmosa* Saussure, 1880, must be substituted for *Myrmosula* Bradley, 1917.

Saussure's name *Paramyrmosa* has escaped the notice of both bibliographers and investigators alike, so I append herewith a bibliographic citation in order that it may be included in any future zoological nomenclators.

PARAMYRMOSA de Saussure, 1880. [in Fedtschenko], *Reise in Turkestan*, II, Zool. Th., 13 Hymenoptera: Scoliidæ, p. 12. [Bull. Imp. Soc. Fr. Nat. Hist., Anthropol., Ethnogr., XXVI, p. 10.]

TYPE: *Myrmosa (Paramyrmosa) Radoszkowskyi* de Saussure, 1880 [= *Paramyrmosa Radoszkowskyi* (de Saussure)]. (Monobasic.)

Tabulation of the diagnostic characters of the three groups of *Myrmosa* recognized by Krombein indicates *Paramyrmosa* differs from *Myrmosa* in so many distinctive structural features that I believe each merits generic status**. On the other hand, the characters differentiating *Myrmosina* from *Myrmosa* are relatively minor ones and entitle it to subgeneric rank only; Krombein has even expressed some doubt as to the validity of *Myrmosina*.‡ In addition, the diagnostic features of the Thoracica Group are sufficiently striking to accord it subgeneric status.

The following key will serve to differentiate the genera and subgenera of Myrmosinae.

1. Winged forms; males.....2
- Wingless forms; females.....3
2. Fore wing with second submarginal cell elongate trapezoidal, broadly sessile on the radial vein; first abdominal sternite simple, unarmed; clypeus simple, not bisected by a keel; hypopygium simple, without lateral lobes or processes; last abdominal tergite convex, not abruptly declivous in lateral aspect.....*Paramyrmosa* de Saussure

*Trans. Amer. Ent. Soc., LXV, pp. 415-465, (1940).

†Spec. Hymen. Europ. & Alger., VIII, p. 123, (1899).

‡Trans. Amer. Ent. Soc., LXV, pp. 438-439, 452, (1940).

**Bridwell expressed this opinion as long ago as 1920 (Proc. Hawaii. Ent. Soc., IV, p. 392.)

- Fore wing with the second submarginal cell trigonal, pointed or narrowly truncate on the radial vein; first abdominal sternite (and generally the second also) armed with a median basal process; clypeus bisected at base by a carinule; hypopygium tripartite; last abdominal tergite abruptly declivous posteriorly.....*Myrmosa* Latreille

Subgenera of *Myrmosa*:

- a. Second abdominal sternite without a median basal process; squamae of genitalia with a deep dorsoventral groove on inner faces; seventh sternite with apical margin emarginate; hypopygium longer than genitalia, and with the median lobe slender, hastate, the lateral lobes simple, without accessory processes and rounded apically.....*Myrmosina* Krombein

-Second abdominal sternite usually with a median basal process; squamae of genitalia not grooved or channeled on inner face.....b

- b. Seventh abdominal sternite with apical margin entire, rounded out; hypopygium longer than genitalia, the median lobe slender, oblaucolate, the lateral lobes simple, without accessory processes and rounded apically.....*Myrmosa senu stricto*

- Seventh abdominal sternite emarginate medio-apically; hypopygium subequal in length to genitalia, and with the median lobe broad, obovate, each lateral lobe generally provided with a long spinoid process making the hypopygium appear quinquepartite or the lateral lobes truncate and emarginate apically. [Type: *Hylaeus thoracicus* Fabricius, 1793=*Myrmosa* (*Krombeinella*) *thoracica* (F.)].....*Krombeinella* new subgenus

- 3. Ocelli absent; clypeus without a median basal spine; mandibles with a basal laminate process on their lower margins; hypostomal carinule tuberculate laterally on each side near posterior mandibular condyles; first abdominal sternite not bisected by a keel; finely punctate forms.....*Paramyrmosa* Saussure

- Ocelli present; clypeus with a median basal spine; mandibles simple, their lower margins without a basal laminate process; hypostomal carinule simple, not tuberculate laterally near posterior mandibular condyles; first abdominal sternite bisected by a keel; coarsely punctate and sculptured forms.....*Myrmosa* Latreille

- a. Head quadrate, broad behind the eyes; stout bodied forms.....*Krombeinella* new subgenus
- Head generally narrowed behind the eyes; slender bodied forms.....*Myrmosa sensu stricto*

The subgenus *Myrmosa* as here understood comprehends the species Krombein assigned to the *Melanocephala* Group with the exception of *minuta* Morawitz, which is here transferred to the genus *Paramyrmosa*.

Krombeinella has been established as a subgenus for the species Krombein placed in the *Thoracica* Group of *Myrmosa*. However, certain forms like *frater* and *brunnipes* are somewhat anomalous and are in need of further study, as, for that matter, are all the Palaearctic species.

Myrmosina comprises the three forms placed in it by Krombein.

The genus *Paramyrmosa* contains, in addition to the five Nearctic species referred to it by Krombein and Mickel***, the Turkestan *Radoszkowskyi* Saussure and also in probability the Transcaspian *minuta* Morawitz. Krombein has assigned the last to *Myrmosa* in the restricted sense, but Morawitz stated very definitely in his description that *minuta* lacks ocelli and that the body is finely punctate. Both of these characteristics are salient features of the females of *Paramyrmosa*. I have little doubt that when the type of *minuta* (probably in the St. Petersburg museum) is studied, it will prove to be a *Paramyrmosa*.

***Pan-Pacific Entom., XVI, pp. 132-134, (1940).

COLLECTING IN SOUTHERN BRITISH COLUMBIA: FINDING OF
THE WATER BEETLE *DERONECTES SPENCERI* * †

BY H. B. LEECH,

Vernon, British Columbia

In late June, 1943, Professor G. J. Spencer and Dr. R. H. Hanford accompanied Mr. Ronald Buckell on an entomological trip into the Cariboo district of central-southern British Columbia. They planned to visit the grasshopper outbreak areas beyond the Gang Ranch, and so after driving through Clinton and up onto the Green Timber Plateau they turned west. Taking the Gang Ranch road and then the Dog Creek cut-off, they soon discovered that the preceding rainy weather and Chinook winds had made the road a quagmire. For several hours they bounced and slid from one mud-hole to the next, wading out to shove and swear when the car gave up; and upon occasion it was bogged to the running boards.

When at last they saw an old camp site beside the road, they camped. Nearby was a pretty little lake with nice clean shores. They tried the water, but found that after boiling for a while it produced a very dense flocculent precipitate and this, combined with a couple of spoonfuls of tea-leaves, gave the filthiest looking mess one could imagine.

Professor Spencer collected insects in and around the lake. Later he sent the water beetles to me, and among some common things were five females and two males of a lovely new species of the dytiscid genus *Deronectes*. Upon extracting the genitalia from the first male, the median lobe was noted to be of such an unusual shape that I mistook the beetle for a freak. In fact I broke the aedeagus in my excitement. The second male was dissected more carefully, and the organs extruded without damage. This individual at once figured in my mind as the type specimen of the new species.

The series was carefully mounted on "points" and put into the drawer of my desk to be labelled at leisure. Of course I gloated over these treasures, and showed them to everyone. Alas! it was done too often, for one morning I saw that the perfect male had had an accident. The extruded appendages were gone. Old tires and a shortage of gasoline restricted travel, but males were needed for a description. A note from that collecting enthusiast Gordon Stace Smith finally spurred me on, and I decided to leave at noon the next day, October 9.

A fellow entomologist, Cecil Morgan, joined me at an hour's notice. We bought groceries enough for a week, including quantities of tree-ripened prunes. Loading the little Austin '8' with camp and collecting equipment, we left Vernon at 2 p.m. The road was badly washboarded as far as Monte Lake but recently graded from there to the black-top near Kamloops, where we stopped only long enough to get gasoline. The day was cool with heavy clouds piling up, and much of our talk dealt with the possibilities of rain. We drove steadily and reached Cache Creek just at dusk, having seen nothing more exciting than great rows of boxes of freshly picked tomatoes in the fields, and several cars with moose heads triumphantly tied to the front bumpers.

Cache Creek sports an auto camp, but it was almost full when we arrived, and the price of the remaining cabin was too much for our Scotch and Welsh ancestry. We were told that the night before latecomers were glad of the privilege of sleeping on the floor of the store; we elected to chance frost and camp beside the Bonaparte River. Turning up the valley we soon found that camping along the Bonaparte was not as easy as it sounded. Neither of us had been north of Cache Creek before. The river may be long but it certainly is not large, and though the road approaches it from time to time there is always a line of

* Contribution No. 2452, Division of Entomology, Department of Agriculture, Ottawa, Ont.

† For original description see *Canad. Ent.* 77 (6):105. (June 1945 issue, published November 3, 1945.)

barbed wire between. We grew desperate, and catching a glimpse of a gateway leading to a hay-meadow, turned the car and squeezed through. Driving around a point of willows, we got out of sight of the road, put up a small tent, collected dry branches, and ate supper by the light of our campfire. The meadow was bumpy and damp, and Cecil didn't feel at all happy about sleeping there but did not mutiny outright. There were no mosquitoes to keep us awake, though a couple of horses stamped around nearby all night.

Away bright and early next morning, we rounded the first bend in the road and realized our tent had been almost upon the back stoop of an Indian's home. The road along the Bonaparte was in good condition and allowed us to enjoy the almost pastel colors of the bare, rolling hills. Climbing steadily, we passed small roadside lakes, and reached Clinton. A few miles beyond, the long winding climb up to the plateau put the Austin into second gear (of four); on top we found most awful washboard and were glad to turn off onto the Gang Ranch road. After fifteen miles of that, we looked back upon the washboard with longing. At mile 17 we drove through someone's backyard, then turned right and along the Dog Creek cut-off. This started nicely, but the car soon took on a motion like that of a small boat running across wind in a choppy sea.

At that time our hopes were high. We had been told that the desired lake was on the right-hand side of the road, just out of sight over a knoll, and from three to five miles from where we left the Gang Ranch road. We had every chance of reaching it before lunch, catching our beetles and camping at Lac la Hache by nightfall.

We drove the first two miles in an off-hand manner, then settled down to business. Every possible camping and turning-out place was investigated. Each knoll was scouted around—the knolls are rare in that gently rolling lodge-pole pine country. It is a depressing place in which to hunt a lake. Pines, all of a size, grow from the edge of the road to apparent infinity; no matter how far you wander, you have the feeling that there is a lake just out of sight, hidden by tree trunks.

We found nothing in the first six miles, so turned around and tried on the way back. Nothing. We tried again, seven miles and back. No lake. The third time we went eight miles and back. Downhearted, we cooked a late lunch. The clouds were low, rain fell intermittently and there was a cold wind. We were not happy.

Back at the cattle ranch, we interrupted an exciting poker game to ask for help. What we knew of the lake was soon told; the cowhands said that the only one with an old log corral at one end was thirteen miles away! It would be dark soon; we had had enough of that road, but wanted the beetles, so At mile eleven we started our old tactics of scouting each likely place. By the time we neared mile fourteen we were down in the dumps again. How easy to miss a hidden lake in that monotonous pine forest. Finally, we drove over a rise, and as we sat in the car, we could see a lake to the right. Turning down an old trail we parked, grabbed sieves, and ran for the water. A few sweeps in the silted bay produced absolutely nothing, but the first try at a rocky promontory nearby showed a half-dozen of the new *Deronectes*. We caught a few more, then went back to set up camp, finishing as darkness fell. After supper we collected by flashlight, and watched the beetles swim and crawl about in the shallow water. The only vegetation noted was a round-stemmed sedge, *Scirpus* sp. A few corixid bugs came twitching out of the deep water, attracted by the light, but cannily stayed out of reach.

The night was chilly with a good deal of rain, and fresh snow fell on the nearest mountains. We had a cold breakfast in the tent, then while Cecil packed

our equipment, I collected beetles, taking over 150 *Deronectes spenceri*. Every scoop of the net brought up numbers of the common *D. striatellus* (LeConte) and quantities of an aquatic bug, *Notonecta kirbyi* Hungerford (det. W. Downes). Collecting was unpleasant; the water was icy and the wind whipped up waves; before long my fingers were too cold to work the tweezers.

On our way again, we found the dirt road greasy, and more rain was falling. So glad were we to have our beetles and be out of there that I trod on the gas too steadily, and a particularly vicious bump broke the main leaf of a front spring.

Our first stop was Beaver Dam Lake, about half-way to the main road; the curious embankment around its east end is said to have been caused by ice driven against the sloping shore. Large waves and a cold wind sent us back to the car before we had many beetles, but I was interested to find *Gyrinus minutus* Fabricius and *G. pectoralis* LeConte, the first of these I had seen alive. About two miles beyond Clinton we had lunch, and collected in the little lakes bordering the road, finding a new species of *Haliphus* and such old friends as *Hygrotus unguicularis* (Crotch), *Rantus frontalis* (Marsham) and *Agabus antennatus* Leech. From there we drove steadily till we reached Deadman River near Savona; the marginal shallows produced *Oreodytes crassulus* (Fall), *Oreodytes* sp., *Bidessus affinis* (Say), *Deronectes griseostriatus* (Degeer), and *Gyrinus picipes* Aube. Roadside ponds at the top of the hill on the other side of Savona yielded such things as *Hygrotus sellatus* (LeConte) and *H. unguicularis*, *Agabus ambiguus* (Say), *A. anthracinus* Mannerheim, *A. nectris* Leech, *Colymbetes exaratus* LeConte, and *C. rugipennis* Sharp, and *Dytiscus marginicollis* LeConte.

A hot supper at Kamloops cheered us up and except for what we thought about the awful washboard between Monte Lake and Vernon, we reached home in a most enviable frame of mind. So ended our trip. Once we were in danger; that was when we camped on the Reserve near Cache Creek. It is a criminal offense to enter an Indian Reservation with liquor in one's possession, and our equipment was replete with vials of 70% ethyl alcohol, a fine preservative for water beetles but not for the internal workings of natives.

THE GEOGRAPHIC RANGE OF *IXODES SORICIS* Gregson.

Ixodes soricis Gregson is known from the type series of adult females, nymphs, and larvae collected by Gregson from long-tailed shrews (*Sorex vagrans* and *S. setosus*) in southwestern British Columbia, and from one female collected by Robert Holdenried from *Sorex trowbridgii* in Marin County, California (Cooley and Kohls, Nat. Inst. Health Bull. No. 184, 1945). Two specimens collected from a long-tailed shrew (*Sorex cinereus*) at Idaho Springs (alt. 7500'), Clear Creek County, Colorado, were identified by Dr. Kohls as females of *I. soricis*. This extends the known geographic range of this tick over nine hundred miles to the east of the locality where the Marin County specimen was taken, and over one thousand miles southeast of the type locality in British Columbia. As the hosts of this tick are shrews of the genus *Sorex* which are widespread and common over northern North America, the distribution of *I. soricis* may be much more extensive than it was formerly believed to be.

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BENZENE HEXACHLORIDE ("666") AS AN ACARICIDE*

BY J. D. GREGSON,

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Preliminary studies of the effectiveness of benzene hexachloride, or more exactly 1, 2, 3, 4, 5, 6-hexachlorocyclohexane, against the paralysis tick, *Dermacentor andersoni* Stiles, have revealed an acaricide more promising than any hitherto tested by this laboratory.

The experiments were conducted with a view to protecting cattle from ticks over a period of several weeks following a single application of the chemical. Failing this, a dilution of benzene hexachloride sufficiently toxic to kill engorging ticks already on animals was sought. The present tests are incomplete insofar that they should be repeated both on a larger scale, and under various climatic conditions to determine their reliability. However, the problem of tick control in Western Canada is of such prime importance that it is felt that a summary of the results gained to date justify their immediate publication.

Six cattle were each sprayed thoroughly over their backs and necks with two quarts of water to which had been added 15 cc. Triton X100 emulsifier plus varying amounts of a dispersible powder containing 50% of partially deodorized benzene hexachloride having a gamma isomer content of 6%. This powder was added in the ratio of $\frac{1}{2}$ lb., $\frac{1}{4}$ lb., $\frac{1}{8}$ lb., $\frac{1}{16}$ lb., and $\frac{1}{32}$ lb. to half an imperial gallon of water. The sprays thus contained a gamma isomer content of approximately 6, 3, 1.5, .75 and .375 lbs. per 100 gallons of fluid respectively. Following the spraying, all animals were infested at weekly intervals with from 20 to 45 *Dermacentor andersoni* ticks of both sexes.

At the rate of 6 lbs. of the gamma isomer per hundred gallons of water complete tick protection appeared to be offered for a period of at least three weeks. Half this strength protected one cow from male ticks for two weeks only, although none of twenty-nine females attached to it at the end of a three week period. Another animal under similar treatment was protected from both sexes until the fourth week. The next two successive dilutions protected cows for two weeks, while the greatest dilution gave protection for one week only.

During the above tests it rained on six separate occasions, the total precipitation being .212 inches. The cattle were subjected to these showers, which, while a normal spring factor, might appreciably have lessened the lasting powers of the treatments. Ticks attached readily to control animals during each infestation. This fact, and the presence of only dead, unattached ticks on treated animals served to confirm the toxicity of 666 to ticks.

Following these laboratory experiments, in which it was found that the greatest strength of 666 used was harmless to cattle, field tests were made on 150 cattle at Merritt, B. C. Each was sprayed over the shoulders, neck and crown of the head with one pint of the strongest mixture previously described (6 lbs. gamma isomer per 100 gallons of water). The remaining hundred or more animals were left untreated as controls. Examination was made two weeks later of seventeen cattle that were available. Of twelve treated animals only two bore ticks, and these had died before attaching. The five untreated controls were either infested with bunches of ticks or bore scars where ticks had recently been rubbed off. In no instance was there any suggestion of injury to the animals by the material used.

In addition to these observations to determine the lasting powers of 666, tests were conducted to discover what strengths were lethal to ticks already engorging. The results of these studies which were made on ticks feeding on sheep, indicate that dilutions of the gamma isomer as great as .023 lbs. per 100 gallons of water are lethal to ticks that have been feeding for only one day. The greatest

*Contribution No. 2447, Division of Entomology, Science Service, Department of Agriculture, Ottawa, Canada.

dilution of the gamma isomer found lethal to ticks that had been feeding for three days was .093 lbs. per 100 gallons; doses of a half and a quarter of this amount failed to kill these ticks. After five days of feeding nothing less than .187 lbs. per 100 gallons gave a complete kill. Eight-day ticks that had fed and dropped from their host were resistant to the gamma isomer at the rate of .375 lbs. per 100 gallons of water, although this and the previous dilution did prevent them from ovipositing. Those subjected to greater dilutions laid eggs which hatched to healthy larvae.

BOOK NOTICE

INSECT MICROBIOLOGY, by Edward A. Steinhaus, 763 pages, 250 illustrations, Comstock Publishing Co., Ithaca, New York, 1946. Price \$7.75.

At a time when the general trend in scientific work is to specialize in a single subject, we are impressed with a new phase of biology which involves several fields. It indicates to us very well the need for a broad scientific training in order that we may undertake research problems in borderline subjects.

Professor Steinhaus, after a brief introduction to insect microbiology, capably discusses the relationship of extracellular and intracellular bacteria to insects. He also includes a chapter giving an extensive list of bacteria which are associated with insects extracellularly. This list gives the scientific name of the bacterium, the insects concerned, and a review of the most important work concerning the organism.

Several chapters are taken up with a discussion of the relationships of yeasts, fungi, viruses, rickettsiae, spirochetes and protozoa to insects. Poliomyelitis receives considerable discussion as one of the virus diseases which may possibly be carried and spread by insects.

There is hope that many of the dreaded diseases known to medicine and pests harmful to animals and plants may be brought under control through a further study in this new field of science.

The final chapter is devoted to a discussion of methods and procedures found by the author to be of use in carrying on problems relating to insect microbiology. The necessary apparatus is discussed briefly, with references to more detailed equipment given.

This book is an excellent introduction to a new field of biology. Over 1600 publications are listed as references, involving bacteriology, mycology, immunology and entomology. It is sure to be useful both as a textbook and a reference.

H. E. Scott.

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